

A SYSTEMATIC REVIEW OF RESEARCH ON TEACHING ANXIETY

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Abstract

Teaching anxiety is a significant affective state that may profoundly affect both the learning and teaching processes. However, there is no conclusive evidence regarding the sources and effects of teaching anxiety in an educational context. The study adopted a research design utilizing a systematic review methodology. This systematic review aims to present an overview of the current literature on teaching anxiety and explore the variables related to teaching anxiety in terms of its causes and effects. In the study, 108 papers were reviewed analyzed by listing the journals, searching the research papers, screening, analyzing, and reviewing. The study concluded that teaching anxiety was directly related to affective states, while the relationship between teaching anxiety levels and demographic variables was not clear. Another conclusion was that teaching experience, content knowledge, and instruction effectively decrease the levels of teaching anxiety. The results also showed that teachers' and students' characteristics, teaching strategies, time and classroom management, planning, school climate, and the use of technology had considerable effects on teaching anxiety.

Keywords: Teaching anxiety, systematic review, content knowledge, instruction

1. Introduction

Teaching anxiety is a considerable affective state that may have some adverse effects on the learning and teaching processes. First, as Bernstein (1983) points out, it is one of the variables that may negatively influence teaching effectiveness. Similarly, it creates an unpleasant work environment and career situations; thus, teaching may be an activity that is avoided. This results in teaching behaviors that are ineffective and inappropriate (Ameen et al., 2002). Moreover, it may adversely affect the preparation and execution of classroom activities and seems to be a problem for a significant number of teachers (Gardner & Leak, 1994), whereas it may reflect real or perceived knowledge deficits in content and teaching skills (Levine, 1993). In other words, teaching anxiety as a dynamic process is affected and changed by practice and experience (Pekrun, 1992) which results in stress and avoidance. Some other issues about teaching anxiety can be listed as the problems concerning planning, time management, and organization of the classroom environment. While it can be seen as a normal human emotion, it may cause failure, a decline in academic performance, inability to concentrate on lessons, avoidance of personal relationships and social surroundings, and being introversion (Eisen & Kearney, 1995; Kunt & Tüm, 2010) Weems et al. 2010). Furthermore, as Austin et al. (2001) note, anxious teachers tend to pass anxiety to some of their students (Austin et al. 2001). In other words, anxious teachers may cause anxiety and poor performance among learners (Koran & Koran, 1981). As a result of teaching anxiety, the teacher may prefer acting as a controller (Czerniak & Haney, 1998), avoiding new teaching methods and techniques (Thomas, 2006), and experience burnout (Byrne, 1994). Below, a theoretical background of teaching and its definition is given before discussing the rationale behind the study.

As Scherer (2009) points out, to define teachers' emotions, an established multicomponential conceptualization, including cognitive, physiological, motivational, and

expressive components, should be understood. Emotions can be characterized by affective feelings, specific thoughts, bodily-physiological changes, action tendencies, and expressive behaviors. Within this scope, the Appraisal Theory posits that it is the individual's judgment of the event rather than an event that causes an emotion (Moors et al., 2013). Based on Bandura's (1986) Social Cognitive Theory, anxiety is negatively associated with self-efficacy due to fear of failure. In addition, Bandura's Theory of Self-efficacy focuses on the ability to control emotional states such as fear, anxiety, and stress (Bandura, 1997).

From a general point of view, teaching anxiety can be defined as the feelings of tension and anxiety that occurs before, during, and after the teaching task (Peker, 2009a; Thomas, 2006). In other words, it is a momentary situational characteristic of teaching and an emotional constitution that may disappear with an increasing experience (Williams, 1991). It is also perceived by teachers in various situations that include a complex psychological phenomenon that is influenced by certain variables (Aslrasouli & Vahid, 2014; Ekşi & Yakışık, 2016).

From the broadest perspective, it should be noted that teaching anxiety is a significant affective state that may have profound effects on both the learning and teaching processes. However, there is no conclusive evidence regarding the sources and effects of teaching anxiety in an educational context. In other words, how teaching anxiety affects the various aspects of the learning and teaching processes and outcomes for teachers and learners should be contextualized. With these concerns in mind, this systematic review aims to present an overview of the current literature on teaching anxiety. Another purpose of the review is to explore the variables related to teaching anxiety regarding its causes and effects. Finally, the study aims at presenting a systematic review of research to make practical recommendations for teachers, teacher trainers, and researchers to guide further research. To this end, the study asks two research questions:

- Does teaching anxiety affect the learning and teaching processes?
- What factors relate to teaching anxiety in an educational context?

2. Method

2.1. Research design

In the current study, the systematic research design was preferred. The systematic review included in a specific methodology that locates current studies, selects the relevant ones, evaluates contributions, analyses, and synthesizes the data collected. Then, it reports the conclusions reached (Denyer & Tranfield, 2009). The rationale behind the systematic research design is that it explores specified research questions derived from realistic problems. Within this scope, it should be stated that it is not a literature review from the traditional perspective. Moreover, a systematic review is also different from other review methods due to its procedure and principles (Harris et al., 2014).

In the study, the systematic review was preferred for several reasons. First, as the study focused on teaching anxiety in the educational context, a reproducible and comprehensive strategy seemed to be necessary. Second, all of the relevant studies needed to be identified. Third, all results obtained from the reviewed studies needed to be assessed for the quality in a balanced summary.

2.2. Data collection and analysis

After formulating the research questions, a research protocol was developed before retrieving the literature. The inclusion and exclusion criteria were then determined before the literature searching, screening, and analysis procedure. For this purpose, the papers were saved, listed, and screened. To analyze the studies, authors' names, publication years, publication sources, the number of the participants, teaching positions and fields, research

designs, data collecting methods, and countries were noted. The storing and analysis processes were performed by using SPSS 22. Finally, the studies were analyzed in accordance with the problem statements, aims, methods, findings, and recommendations. The research process was detailed below.

As seen in Figure 1, the article selection process included three steps. First, the journals listed in the Social Sciences Citation Index (SSCI), Scopus, and Education Resources Information Center (ERIC) were taken into account for obtaining research papers to review. The rationale behind index selection was to reach research papers in only high-quality journals regarding data accuracy, reliability, and validity. Another reason was to limit this search to journals publishing papers within the educational context. After the basic search which includes the keyword “teaching anxiety” in accordance with their topics and titles, 177 papers were listed. Second, after screening the articles, 69 papers were excluded as they appeared to be duplicated ($n=54$) and off-topic ($n=15$). In addition, six papers were excluded as the full-texts were not available, whereas four papers were removed as they included reviews. Finally, 108 articles that focused on teaching anxiety and reported research activities were included in the study. To be brief, the publications that focused on teaching anxiety in an educational context were included in the review process.

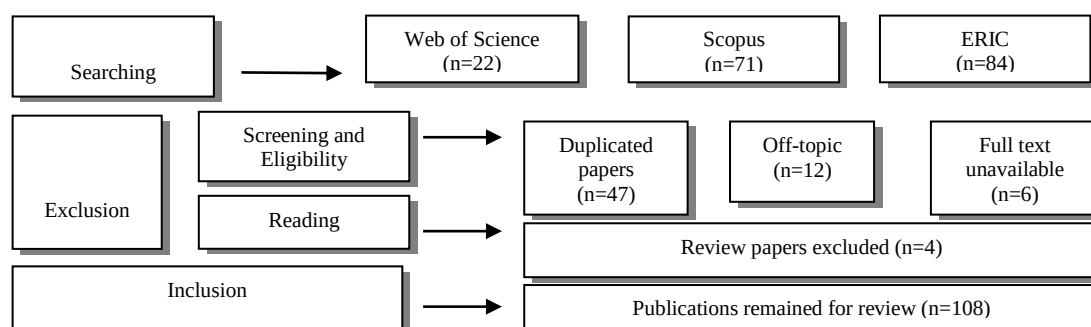


Figure 1. Flowchart for the selection process

All of the studies on the topic were included in the review. The language of the publications was English, whereas four papers that had the abstracts in English were written in the Turkish language. The papers were published in 93 journals, whereas the publication period was between 1973 and 2019. The numbers of participants in the studies were within the range of one and 1568 in the process of pre-service- and in-service teaching. The studies that were designed to be qualitative, descriptive, correlational, quasi-experimental, experimental, action, and mixed-method focused on 17 teaching fields. In addition, the tools used in the studies were questionnaires, surveys, interviews, assignments, reflections, scales, self-report questionnaires, observations, inventories, and personal narratives, whereas they were performed in 16 different countries.

3. Results

3.1. Analysis of the publications

As seen in Appendix 1, 108 publications were reviewed. When the publication years were considered, it can be seen that the interest in research on teaching anxiety showed an increase since 2009, while rare studies appeared between the years of 1973 and 2008, as indicated in Figure 2. The number of participants was between 1 and 1568. When the teaching position was considered, it can be seen that the researchers mainly preferred to include pre-service teachers. In other words, of the participants in the studies, the sample groups of 65 (60.2%)

studies consisted of pre-service teachers, while 43 (39.8%) studies included in-service teachers as sample groups.

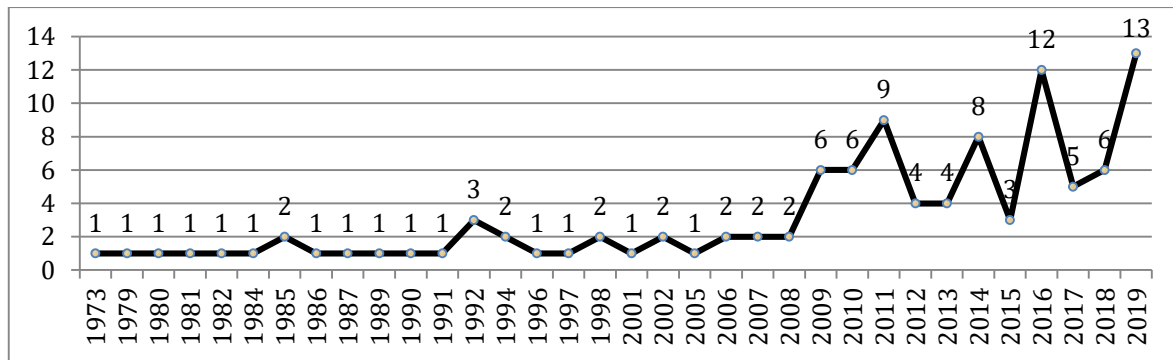


Figure 2. Distributions of the publications per year

Figure 3 shows the teaching fields and their distributions in numbers. According to the values, 36 (33.3%) studies focused on teaching Mathematics, whereas 27 (25.0%) studies used teachers as participants regardless of their teaching fields. Of the studies, 11 (10.2%) were in the field of English as a foreign language, and 11 (10.2%) studies focused on the Elementary Education context. In addition, eight studies (7.4%) were on Science Education, while three studies (2.8%) were related to Music Education. Two studies (1.9%) on Accounting and two (1.9%) on Early Childhood Education appeared. The teaching fields included once (0.9%) in the studies were Library, Psychology, English as a first language, Agriculture, Sociology, Computer and Instructional Technologies, Physical Education, and Nurse Education.

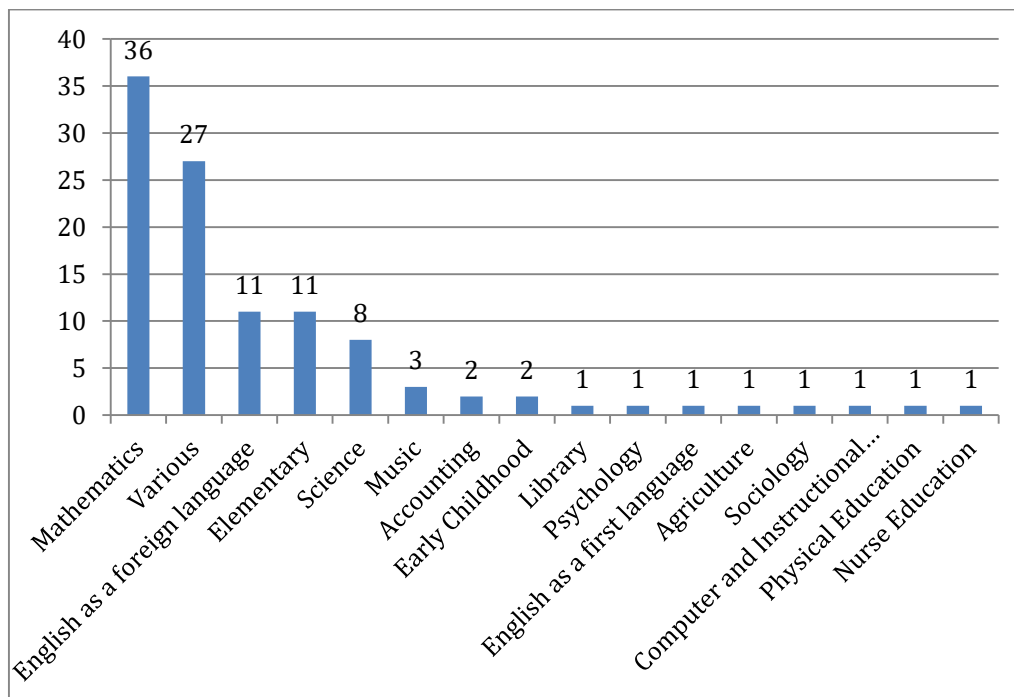


Figure 3. The number of studies by teaching fields

As seen in Table 1, researchers used a variety of research designs. In 58 studies (53.70%), a descriptive research design was preferred by authors, whereas researchers performed 19 correlational studies (17.59%). Of the studies, 15 (13.89%) were designed to be qualitative, whereas 11 studies (10.19%) were experimental. Only three studies (2.78%) used the mixed-method research design. Finally, one quasi-experimental (0.93%) and one action research (0.93%) appeared.

Table 1. *Research designs preferred*

Research designs	Frequency	Percent
Descriptive	58	53.70
Correlational	19	17.59
Qualitative	15	13.89
Experimental	11	10.19
Mixed-method	3	2.78
Quasi-experimental	1	0.93
Action research	1	0.93

Table 2 indicates the research tools used in the studies. According to the values in the table, 67 studies (62.04%) used scales in their research, whereas, in 11 studies (10.19%), questionnaires were preferred. In 10 studies (9.26%), surveys were used as data collection tools. Six researchers (5.56%) preferred interviews. In addition, four studies (3.70%) used inventories, whereas three (2.78%) included reflections. The researchers preferred self-report questionnaires in three studies (2.78%), observations in two studies (1.85%), one assignment (0.93%), and one personal narrative (0.93%) as data gathering tools.

Table 2. *Research tools used*

Research Tools	Frequency	Percent
Scale	67	62.04
Questionnaire	11	10.19
Survey	10	9.26
Interview	6	5.56
Inventory	4	3.70
Reflection	3	2.78
Self-report questionnaire	3	2.78
Observation	2	1.85
Assignment	1	0.93
Personal narrative	1	0.93

Figure 4 demonstrates the distribution of studies by countries. According to the values, 44 (40.7%) of the studies were performed in the Turkish educational context, whereas 38 studies (35.2%) were carried out in the USA. Of the studies, five (4.6%) were performed in the Canadian educational context, whereas four (3.7%) were carried out in Australia. To add, three studies (2.8%) in Iran, three studies (2.8%) in Japan, three studies (2.8%) in the UK, and two studies (1.9%) in China were performed. Finally, only one study (0.9%) appeared in countries such as Germany, Korea, North Cyprus, Oman, and Lebanon.

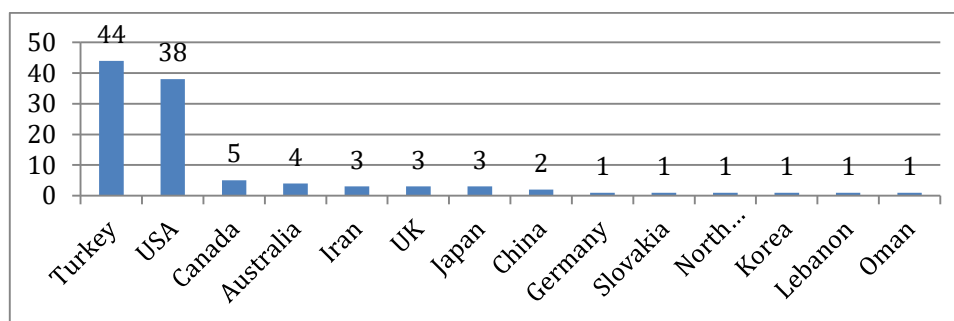


Figure 4. The distribution of studies by countries

3.2. Research results

3.2.1. Beliefs and affective states

Research indicates that beliefs and teaching anxiety are interrelated. For instance, to answer whether anxiety and confidence levels in teaching elementary mathematics and science were interrelated, Bursal and Paznokas (2006) used the confidence and anxiety scores to collect data. The findings showed that math anxiety might be related to teachers' beliefs. Ertekin et al. (2010) examined the relationship between teaching anxiety among pre-service teachers of mathematics and their epistemological beliefs and found a negative correlation between them. In their scale development study that focused on the validation of the Math Anxiety Scale for Teachers, Ganley et al. (2019) found that higher mathematics anxiety was related to traditional beliefs about teaching and learning. In a predictive correlational survey study, Peker and Ulu (2018) focused on the effects of beliefs about mathematics teaching and learning on the level of teaching anxiety. They concluded that traditional beliefs did not affect teaching anxiety, while constructivist beliefs directly affected anxiety regarding content knowledge. Finally, Ünlü et al. (2017) investigated the relationships between self-efficacy beliefs, mathematics anxiety, and mathematics teaching anxiety among pre-service teachers. They found that the most considerable variable affecting mathematics teaching anxiety was self-efficacy beliefs towards mathematics teaching.

Research results show that teaching anxiety and attitudes towards teaching are correlated. As an example, Ertekin (2010) concluded that anxiety and attitudes towards teaching were significantly correlated. In another study that hypothesized that teachers' efficacy beliefs were predicted by teaching anxiety and teaching attitudes, Al-Mehrzi et al. (2011) carried out a path-analysis on the effects of teaching anxiety and attitudes on efficacy beliefs. The study found that attitudes were a predictor of teaching anxiety among pre-service teachers of Arabic Language, Science, Mathematics, Instructional Technologies, and Psychical Education. Furthermore, Senler (2016) explored the relationships among self-efficacy, locus of control, attitudes towards science teaching, and teaching anxiety among pre-service teachers of science. In this conceptual model, she found that attitudes were positively related to teaching anxiety. Finally, Yavuz (2018) analyzed the levels of teaching anxiety among pre-service teachers of mathematics and elementary education. The study concluded that negative attitudes towards teaching were one of the sources of anxiety.

Rare studies on motivation and self-esteem showed that motivation and teaching anxiety are correlated. Drawing attention to the lack of research on teaching anxiety in the context of English as a foreign language teaching, Aydin (2016) focused on the sources of anxiety and concluded that pre-service teachers suffered from teaching anxiety due to demotivation, amotivation. In another study, Cheung and Hui (2011) aimed to determine the levels of teaching anxiety among in-service teachers from various fields. In the study, the trait anxiety scale, the self-esteem scale, and the teaching anxiety scale were administered to 333

participants. The study concluded that teaching anxiety was found to be predicted by self-esteem.

According to research results, teaching anxiety is correlated with other types of anxiety. In a broader sense, Wilson (2013) noted that mathematics anxiety among pre-service teachers affected their future teaching of mathematics. In a study that explored experiences of mathematics anxiety and mathematics teaching anxiety, and the relationship between the types of anxiety, Olson and Stoehr (2019) found that anxiety and teaching anxiety might be similar. In terms of the level of teaching anxiety, Amen et al. (2002), in their descriptive research, explored the level of teaching anxiety among accounting educators and the relationship between the anxiety levels and several demographic variables such as academic rank, age, and teaching experience in years and training received. They found that 78% of the participants suffered from teaching anxiety, whereas 70% had it regularly. Furthermore, in a study mentioned above, Cheung and Hui (2011) stated that teaching anxiety was predicted by trait anxiety. Aydin (2016) also noted that pre-service teachers of English as a foreign language suffered from teaching anxiety and that fear of negative evaluation was one of the strong sources of teaching anxiety. In another study, Peker and Ertekin (2011) investigated gender differences regarding teaching anxiety among pre-service teachers of mathematics. They concluded that teaching anxiety and mathematics anxiety were positively correlated. In terms of anxiety provoked by public speaking, Amen et al. (2002) found that public speaking was not associated with teaching anxiety. Similarly, in his correlational study that aimed to examine the levels of speech anxiety among pre-service teachers of English as a foreign language, Turkish as a native language, and pre-school, Kana (2015) who used a relational screening model found that pre-service teachers had speech anxiety problems when they had to speak during teaching activities. In terms of test anxiety, considering that anxiety was one of the major predictors of academic performance, Yadav and Sharma (2013) examined the relationship between anxiety levels and teacher trainees' academic achievement. They found a significant relationship between anxiety and academic achievement, whereas Vitale (2012) noted that fear of failure was a source of anxiety after writing and analyzing a rich collection of journal entries through autobiographical and phenomenological perspectives. Ümmet (2016) examined anxiety among prospective teachers regarding their perceptions of a public staff selection examination used to select teachers to be appointed to public schools. The study found a correlation between the levels of anxiety and the scores obtained from the mentioned examination. In another study, Özdemir and Seker (2017) aimed to investigate mathematics anxiety among prospective primary school teachers and noted that examinations provoked anxiety. Finally, considering teaching anxiety about an academic domain can influence the students' learning, Gunderson et al. (2013) investigated the relationship between them. After measuring spatial anxiety among teachers and students' spatial skills, they found that spatial anxiety among teachers predicted teachers' mathematics anxiety.

Research demonstrates that teaching anxiety also relates to efficacy. First, Gresham (2009) administered the Mathematics Anxiety Rating Scale and the Mathematics Teaching Efficacy Beliefs Instruments to pre-service teachers of mathematics to explore the relationship between efficacy and teachers' mathematics and found that the ones with the highest levels of efficacy had the lowest degree of anxiety. Similarly, Yürük (2011) examined the relationship between teaching anxiety and self-efficacy beliefs among prospective teachers of science and found that teaching efficacy was one of the predictors of teaching anxiety. In addition, Kılıç (2015) examined computer anxiety and self-efficacy among music teachers and found a negative correlation between computer anxiety and self-efficacy. In a study mentioned above, Ünlü et al. (2017) found that the most considerable variable affecting mathematics teaching anxiety was self-efficacy beliefs towards mathematics teaching. Finally, Peker (2016) investigated the relationship between teaching anxiety and self-efficacy beliefs toward mathematics teaching

among mathematics teachers through path analysis. He found that the lack of content knowledge regarding teaching anxiety had negative influences on self-efficacy.

Some more variables such as stress, burnout, aggressiveness, self-deception, locus of control, and confidence among teachers seem related to teaching anxiety. For instance, Capel (1992) aimed at determining the causes of stress and burnout among middle, high school, and college teachers. She found that a high level of anxiety predicted stress and burnout. Considering that one explanation for attrition might be the emotional nature of the profession, Mahmoodi-Shahrehabaki (2017) explored the intervening effect of anxiety among English as a foreign language teachers on the correlation between burnout and perfectionism levels. After analyzing data through structural equation modeling, the study concluded that direct associations between perfectionism and emotional exhaustion were significant because of the intervening impact of anxiety. Furthermore, Cankaya (2011) investigated the effects of anxiety on aggressiveness among pre-service teachers and concluded that the effects of anxiety on aggressiveness were reduced when mediated through anger. Given that teachers' emotions were relevant for the functioning of classrooms and that research was lacking regarding the scale development, Frenzel et al. (2016) aimed at developing a scale that measured enjoyment, anger, and anxiety among teachers. They tested the Teaching Emotions Scale and reached a high level of reliability and validity, whereas they found that teaching anxiety showed a weak negative correlation with self-deception. In a study mentioned above, Senler (2016) found that teachers' locus of control was positively related to teaching anxiety. Bursal and Paznokas (2006) also stated that pre-service teachers who experienced a low level of anxiety felt more confident. Finally, in an earlier study, Sinclair and Ryan (1987) examined teaching anxiety among nurse educators and found that anxiety was related to teacher confidence.

3.2.2. Age, gender, grade, teaching field, rank, and status differences

Research shows that age difference regarding teaching anxiety is at conflict. For instance, in a study mentioned above, Amen et al. (2002) noted that age was not associated with anxiety. Karataş et al. (2014), in a study that examined trait and state anxiety and cursive handwriting anxiety among teachers in relation to several factors, found that age was correlated with anxiety levels. Given that academic librarians had active teaching roles in higher education and that teaching anxiety studies mainly focused on classroom teachers only, Davis (2007) aimed to determine whether teacher anxiety causes and symptoms were consistent within academic librarianship. After administering a 35-item questionnaire to 382 academic librarians, the study concluded that experiencing physical and mental or emotional anxiety symptoms was not related to age. On the other hand, in a study that focused on English as a foreign language teachers' opinions and perceptions, Kralova and Tirpakova (2019) investigated the link between anxiety and age and found a negative correlation between teaching anxiety and age.

Studies also showed that there is no consensus on the relationship between gender and teaching anxiety levels. In one of the earlier studies, Preece (1979) measured the teaching anxiety levels at the beginning and end of a teaching course and found that gender was not a considerable variable. Kayan Fadlilmula (2012) who focused on the relationships between anxiety levels among pre-service mathematics teachers, and several variables, noted that anxiety levels did not change regarding gender. Similarly, Karataş et al. (2014) examined trait and state anxiety and cursive handwriting anxiety among several factors and found that gender was not a factor related to anxiety. In contrast, Aslrasouli and Vahid (2014) aimed to identify the sources of teaching anxiety among English as a foreign language teacher in terms of gender and found no correlation between anxiety levels and gender. Similar to the mentioned results, Ümmet (2016) examined anxiety among prospective teachers in terms of

their perceptions of a public staff selection examination that was used to select teachers to be appointed to public schools and concluded that their gender and departments were not related to anxiety. Similarly, Shirvani (2018) carried out a survey study to examine mathematics teaching anxiety and mathematics anxiety among pre-service teachers from the fields of elementary education, engineering and science, and art and humanities and found that there was no significant difference regarding gender. Next, Özcan (2019) investigated anxiety stemmed from not being appointed as teachers among student teachers from various fields and found that their gender was not related to anxiety levels. Last, Durdukoca and Atalay (2019) explored the relationship between self-efficacy and occupational anxiety levels among prospective teachers in a teacher training certificate program. The participants were candidate teachers in the fields of arts and sciences, physical education and sports, and fine arts. They found that gender was not correlated with the levels of anxiety. On the other hand, the results of some studies show that female teachers are more anxious than males. For example, given that anxiety might constitute an essential factor in teaching for classroom success, Morton et al. (1997) aimed to explore the nature of anxiety among student teachers. They concluded that female participants showed a higher level of anxiety than males. Yazıcı and Ertekin (2010) also found that females were more anxious than males in content knowledge of mathematics. Similarly, Malinsky et al. (2006) examined mathematics anxiety among pre-service teachers and found a significant correlation between anxiety levels and gender. Ertekin (2010) also reported that female participants felt more anxious when compared to males. In another study, Paker (2011) aimed to examine the possible sources of anxiety and found that female student teachers were more anxious than males. Similar to the findings of the studies above, Özen and Öztürk (2016) examined the relationships between teaching profession anxiety levels and lifelong learning among pre-service teachers concerning their gender. They found that female participants were more anxious when compared to males. Considering that the use of Tablet PCs, in particular, played an essential role in increasing the effectiveness and efficiency of the learning and teaching processes, Öztürk (2018) aimed to explore the level of anxiety about using tablet PCs and concluded that female teachers seemed more anxious than males. Furthermore, Ramazanoğlu and Toytok (2018) investigated the anxiety levels of teacher candidates in terms of the use of Facebook in education through a descriptive survey model and found that female candidate teachers were more anxious than males.

A limited number of studies show that there is also no consensus on grade difference regarding teaching anxiety. First, Kayan Fadlelmula (2012) found that senior students were more anxious than sophomores and juniors. On the other hand, Sağlam (2014) stated that anxiety in the context of mathematics teaching decreased in their upper grades. Second, the results of several studies show no correlation between grade and teaching anxiety. For example, Özcan (2019) noted that grade was not related to anxiety levels. Similarly, Ramazanoğlu and Toytok (2018) reached no correlation between anxiety levels and grades.

Studies show conflicting results in terms of teachers' fields and teaching anxiety levels. In an earlier study, Westerback et al. (1985) compared two groups of pre-service elementary teachers and students in geology courses about teaching anxiety. They found that pre-service elementary teachers were more anxious about identifying minerals and rocks when compared to geology students. On the other hand, while Öztürk (2018) found that Turkish as a native language teachers were more anxious than primary school teachers, some other studies concluded that teaching fields were not related to anxiety levels. Ümmet (2016), for instance, noted that departments were not related to anxiety. Shirvani (2018) carried out a survey study to examine mathematics teaching anxiety and mathematics anxiety among pre-service teachers from the fields of elementary education, engineering and science, and art and humanities. It was found that education fields had no effects on both types of anxiety. Yavuz (2018) also stated that pre-service teachers of elementary education experienced more anxiety

than the ones from the field of mathematics. Finally, Durdukoca and Atalay (2019) also found that the departments studied were not correlated with anxiety levels.

Research also shows that there is a relation between rank and teaching anxiety. For instance, Gardner and Leak (1994) focused on the characteristics and correlations of teaching anxiety among college psychology teachers and found that academic rank was correlated with anxiety. Similarly, Amen et al. (2002) noted that their rank and tenure status were not associated with anxiety. In a recent study, Song and Park (2019) aimed to illuminate an ideological understanding of teachers' anxiety in foreign language teaching context and a deep sense of insecurity. They noted that teachers' emotions were shaped by dominant ideologies that constituted the social structures in their teaching position. In another study, Engin (2019) aimed to explore pre-service teachers' anxiety levels regarding their appointment to the teaching profession and concluded that difficulties in finding a job caused anxiety, whereas Ihtiyaroglu (2019) found that occupational exam and the socio-economic situation resulted in anxiety.

3.2.3. Teaching experience, content knowledge, and instruction

Research shows that there is a strong relationship between the levels of teaching experience and teaching anxiety. In an earlier study, Chavez and Widmer (1982) noted that while mathematics teachers' unpleasant experiences were the source of anxiety, Gardner and Leak (1994) found that teaching experience was correlated with anxiety. After noting that culture and classroom atmosphere might affect the level of teaching anxiety among pre-service mathematics teachers in a Turkish educational context, Bekdemir (2010) investigated how negative experiences affected anxiety and found that problematic classroom experiences provoked anxiety. In their qualitative study, Brown et al. (2011) concluded that negative prior experiences resulted in mathematics teaching anxiety. In a similar study focusing on teaching anxiety among pre-service mathematics teachers due to less attention paid to teaching anxiety in classroom settings, Brown et al. (2012) analyzed the reflections at the end of a mathematics practice-teaching process. They found that previous experiences with mathematics caused anxiety. Next, Aslrasouli and Vahid (2014) noted that novice teachers experienced a high level of anxiety, whereas Karataş et al. (2014) stated that teaching experience was correlated with anxiety levels. Drawing attention to the lack of research on teaching anxiety in the English as a foreign language teaching context, Aydin (2016) focused on the sources of anxiety and concluded that pre-service teachers who had a lack of teaching experience suffered teaching anxiety. Moreover, Kralova and Tirpakova (2019) found a negative correlation between teaching anxiety and teaching experience. Given that Japanese teachers of English as a foreign language might feel anxiety due to several factors, Machida (2016) examined their anxiety levels and the relationship between anxiety and variables. After administering the Teacher Foreign Language Anxiety Scale to 133 teachers, it was noted that teaching inexperience was among the sources of anxiety among teachers. Last, in a study that explored experiences of mathematics anxiety and mathematics teaching anxiety, and the relationship between the types of anxiety, Olson and Stoehr (2019) found that teachers perceived a logical continuity of their experiences in terms of mathematics anxiety as learners.

On the other hand, few studies concluded that teaching anxiety is not related to teaching experience. For example, Amen et al. (2002) noted that teaching experience was not associated with anxiety. Similarly, Davis (2007) stated that physical and mental or emotional symptoms of anxiety were not related to career length.

Research results indicate that content knowledge and teaching anxiety are closely and directly related. As reviewed above, Westerback et al. (1985) found that pre-service elementary teachers were more anxious about identifying minerals and rocks when compared

to geology students. In another study, Signer (1986) investigated the possible effects of in-service instruction of computer programming on teaching anxiety among mathematics teachers and found that teachers enrolled in the BASIC programming program experienced more anxiety than those enrolled in the LOGO/PILOT course. Considering that the nature of mathematics induced anxiety, Deniz and Üldas (2008) aimed to develop a tool to measure mathematics anxiety among teachers and prospective teachers. While the study focused on scale development in the broadest sense, mathematics teaching anxiety was one of the sub-factors stemmed from complex structures, including multiple operations and intensive symbols. In another study, Yazıcı et al. (2011) examined the relationship between mathematical values and teaching anxiety among pre-service teachers of mathematics. In this correlational study, they found a low level of correlation between mathematical values and teaching anxiety, while the results showed that constructivist values might be a predictor of teaching anxiety. In a study, as mentioned earlier, Brown et al. (2012) found that teaching anxiety was connected to content knowledge. Sağlam (2014) also found that anxiety in the mathematics teaching context decreased in their upper grades. In contrast, Seckin and Yilmaz (2014) who aimed to examine the effects of the case study method in chemistry laboratory classes on anxiety among pre-service teachers of science concluded that the use of case study and traditional methods had different effects on decreasing the levels of anxiety. Furthermore, Aydin (2016) stated that a low level of target language proficiency was a strong source of teaching anxiety. Similarly, Machida (2016) noted that negative perceptions of English proficiency provoked anxiety among teachers. Kralova and Tirpakova (2019) also stated that staying in an English-speaking country and the intensity of communication with native speakers of English were related to teaching anxiety. In a mixed-method study, Vinson (2001) examined the changes among future mathematics teachers in different mathematics materials and methods classes and found a significant difference in anxiety levels and the classes. Yamaguchi et al. (2016) aimed to explore anxiety among Japanese teachers of psychical education. They found that anxiety was related to the lack of knowledge. In another study, Peker (2016) found that content knowledge regarding teaching anxiety negatively influenced self-efficacy, whereas Yorulmaz et al. (2017) found a negative correlation between mathematical thinking and anxiety levels. In another study, Zahal (2016) investigated the relationship among solo singing, instrument type, learning styles, and musical performance anxiety among pre-service music teachers and concluded that musical performance anxiety was at a medium level. In addition, a significant correlation was found regarding anxiety and the above-mentioned variables. Peker and Ulu (2018) also concluded that constructivist beliefs directly affected anxiety regarding content knowledge, whereas Ganley et al. (2019) found that higher mathematics anxiety was related to low-level mathematical knowledge. As a final study, Aksu and Kul (2019) examined the mediating role of mathematics teaching efficacy in the relationship between pedagogical content knowledge and mathematics teaching anxiety among pre-service teachers. The findings showed that a high level of pedagogical content knowledge decreased teaching anxiety.

Research results demonstrate that instruction is a considerable variable that decreases the level of anxiety among teachers. In an earlier study, Preece (1979) measured the teaching anxiety levels at the beginning and end of a teaching course and found a considerable decrease in anxiety. In another earlier research, Guzicki et al. (1980) examined the efficacy of three 2-hour cue-controlled relaxation workshops in reducing the anxiety levels of two elementary school teachers by using self-report of internal states and direct observation of external behavior. They stated that training in the self-management of stress and tension could affect anxiety levels. Similarly, Sinclair and Nicoll (1981) used questionnaires and interviews to explore student teachers' anxiety. They found that their anxiety level decreased after a three-week practice session, whereas Sharp and Forman (1985) compared stress inoculation

training and classroom management training on teacher anxiety and found that stress inoculation training improved teachers' affect. In another study that focused on diminishing the negative emotions such as threat, tension, worry, fear, and anxiety related to the student teaching field experience, Payne and Manning (1990) used experimental and assessment control groups and found that the training program was effective for decreasing self-reported anxiety about teaching. In an experimental study, Williams (1991) examined the effects of a comprehensive teaching assistant training program on teaching anxiety. The results indicated that the training program reduced teaching anxiety. By using parent-teacher conferences through role-plays, Johns (1992) aimed to lower teaching anxiety among elementary teachers and concluded that dealing with unexpected parent-teacher conferences caused anxiety, whereas role-plays effectively decreased the level of anxiety. Pigge and Marso (1994) also found that teacher candidates felt a lower level of anxiety as they progressed in a teacher preparation program, whereas Morton et al. (1997) noted that instructional preparation reduced anxiety. In an experimental study, Czerniak and Haney (1998) aimed to examine the effects of the use of concept mapping on teaching anxiety among 118 pre-service teachers of elementary education. After the pre-and post-test administration of the Physical Anxiety Scale, they reported that concept mapping reduced teaching anxiety. Roach (2003) examined anxiety among new graduate teaching assistants from various disciplines and coping strategies with anxiety. Results showed that the use of visualization and help from mentors decreased communication apprehension. Peker (2009b; 2009c) also found that the ones who used problem-solving strategies and the microteaching process used in teaching practicum felt less anxious than those who used traditional instruction. Gresham (2010) also stated that the level of anxiety significantly decreased after the mathematics methods course, including manipulatives and other activities that changed anxiety levels among pre-service teachers of mathematics by measuring. Similarly, Yürük (2011) found that teaching efficacy and the number of science courses were the predictors of teaching anxiety. In their descriptive and correlational study, Daniels et al. (2011) tested how classroom dynamics, including curriculum, instruction, assessment, intrapersonal reflection, ethics of teaching, and professional learning community predicted teaching anxiety. They found that the instruction process reduced teaching anxiety. Hypothesizing that using and modeling concrete materials and emphasizing conceptual understanding would diminish anxiety, Lake and Kelly (2014) examined pre-service teachers' mathematics anxiety. In this qualitative study, it was found that mathematics anxiety among pre-service teachers slightly decreased. Given that testing the effectiveness of teacher assistant training programs was typically limited to measures of satisfaction from students' perspective, Pelton (2014) measured the levels of teaching anxiety and teacher efficacy to investigate the effects of a newly established teaching seminar among sociology graduate students, and found that the seminar lowered their anxiety levels and increased the levels of confidence. In their experimental study, Hawley and Sinatra (2019) examined the outcomes of a professional development workshop in terms of motivational and identity features of science teachers who taught evolution. The findings indicated that, after the workshop, teachers' negative emotions were reduced. Finally, Hughes et al. (2019), in their quantitative study, investigated the relationships among and the instructional practices in mathematics, mathematics anxiety, and beliefs about mathematics and its teaching and learning. They found that teachers who experienced higher levels of mathematics anxiety were the ones who used less standards-based instruction and teaching. While the results presented above show a significant correlation between instruction and teaching anxiety, only one study claims contradictory results. In their research, Amen et al. (2002) noted that formal training in teaching was not associated with anxiety.

3.2.4. Teachers' and students' characteristics

The results of the studies demonstrate that teachers' characteristics are one of the significant variables that may affect the level of teaching anxiety. As an example, Pigge and Marso (1994) found that introverted candidates were more anxious than extroverts. Gresham (2007) investigated the relationship between learning styles in elementary pre-service teachers and mathematics anxiety in a descriptive study. After administering the Mathematics Anxiety Rating Scale and Style Analysis Survey to 264 participants, it was found that global learners have higher levels of mathematics anxiety when compared to visual, auditory, tactile, extroverted, introverted, intuitive-random, concrete sequential, closure-oriented and open learners. Peker (2009a) investigated the relationship between teaching anxiety among mathematics teachers and their learning styles. This descriptive study concluded that convergent learners had a lower level of teaching anxiety than divergent, accommodator, and assimilator learners. Among them, divergent learners experienced the highest level of anxiety. Similarly, hypothesizing that teaching anxiety is prevalent among professors, Houlihan et al. (2009) examined the different types of in-class behavior in relation to teaching anxiety and personality among university professors. They found that lower extraversion and neuroticism were the sources of higher levels of teaching anxiety. In a study that reported on interviews with English teachers who discussed the strategies they used regarding the responsibility of A-level English language teaching for the first time, Giovanelli (2015) found that when anxiety and self-doubt decreased, they felt the experience marked clearly in their identity development. Özen and Öztürk (2016) also found a low relationship between lifelong learning tendencies and anxiety levels.

Research results show that the relationship between students' characteristics and the levels of anxiety are conflicting. For example, in an earlier study, Doyal and Forsyth (1973) examined the relationship between the levels of teaching among teachers and anxiety experienced by 3rd-grade students at an elementary school. They found that there was a significant relationship between the anxiety levels among teachers and students. To add, Robinson and Clay (2005) examined the relationship between teaching and student violence. They found that teachers with higher anxiety levels identified low-severity warning signs more frequently. On the other hand, Brown et al. (2011) also noted that teaching children was not related to anxiety levels. In another study, Brown et al. (2012) found that children's understandings caused anxiety.

3.2.5. Teaching strategies, time and classroom management, and planning

Only one study appeared on the effects of teaching strategies on teaching anxiety. In their qualitative multiple case study, Gresham and Burleigh (2019) explored whether the reform-based constructivist methods used in a mathematics method course affected self-efficacy, beliefs, and anxiety. Findings showed that the use of various reform-based strategies was effective in decreasing the level of mathematics anxiety.

According to the research results, time and classroom management are correlated to teaching anxiety. For instance, Sharp and Forman (1985) noted that classroom management training improved teachers' affect. Similarly, Morton et al. (1997) noted that problems concerning classroom management provoked anxiety. Furthermore, Paker (2011) noted that problems related to classroom management were anxiety-provoking factors. In another study, Oral (2012) investigated anxiety about classroom management among pre-service teachers from various disciplines. He found a positive correlation between behaviors regarding communication in the classroom and behavior management, and teaching management anxiety. Finally, in a qualitative study, Han and Tulgar (2019) examined the construct of English as a foreign language teaching anxiety among pre-service teachers. For them, problems related to classroom management were one of the major teaching anxiety sources.

Last, research shows that problems in terms of planning and unpreparedness for the classes were the sources of teaching anxiety. Sinclair and Ryan (1987) found that anxiety was related to perceptions about lesson organization. Brown et al. (2012) also stated that unpreparedness for the classes was a source of anxiety. Daniels et al. (2011) noted that feelings of preparedness in the curriculum, instruction, and assessment reduced teaching anxiety, whereas the ethics of teaching dimension decreased anxiety.

3.2.6. School climate and technology

Research on school climate and the levels of teaching anxiety seem to be interrelated. For example, as Chavez and Widmer (1982) found, mathematics teachers who were positive about learning climate experience had a low anxiety level. In another earlier study, Cotterell (1984) noted that teachers working in open-plan schools experienced more anxiety and tension than those in conventional schools. In a study, Kotrlik and Smith (1989) measured the level of computer anxiety among agriculture teachers and found that the principal's support predicted anxiety. Morton et al. (1997) also found that staff relations provoked anxiety. Similarly, Savas et al. (2013) aimed to find the moderation effect of anxiety competencies among in-service teachers regarding primary empowerment and organizational commitment and concluded that empowerment competencies and anxiety predicted the levels of organizational commitment. Finally, in a grounded theory qualitative study, Yorimitsu et al. (2014) examined 14 Japanese high school teachers' teaching experiences and found that teachers referred to stress and anxiety that negative work pressures placed on them as having 'no space in the heart.'

According to the results of the studies, the use of technology is one of the predictors of teaching anxiety. As mentioned above, Signer (1986) noted that teachers who enrolled in the BASIC programming program experienced more anxiety when compared to the ones who were enrolled in the LOGO/PILOT course. Kotrlik and Smith (1989) also found that computer skills predicted anxiety. In another study, Savenye (1992) examined pre-service teachers' computer experience and whether their attitudes and feelings were influenced by participation in a computer course. The study concluded that participation in a semester-long computer literacy course produced positive attitudes toward computers and reduced computer anxiety among pre-service teachers. To understand whether anxiety levels were related to educators' use of networked resources, Harris and Grandgenett (1996) examined the correlations among writing apprehension, oral communication apprehension, computer anxiety, age, teaching experience, and telecomputing experience. They concluded that writing apprehension among teachers was negatively correlated with network use. Yaghi and Abu-Saba (1998) also examined computer anxiety among teachers from various fields and found that computing experience played an essential role in reducing anxiety toward computers. Similarly, Liu (2008) examined the effects of online discussion of anxiety towards teaching mathematics among elementary teacher candidates. It was found that online discussions reduced anxiety caused by the perception in which mathematics was difficult. In their experimental study, Peker and Halat (2009) aimed to explore the effects of mathematical representations developed via WebQuest and spreadsheet activities on the levels of teaching anxiety among pre-service teachers of mathematics. After administering the Mathematics Teaching Anxiety Scale to the participants in the control and experimental groups, they concluded that the use of WebQuest decreased the level of teaching anxiety when compared to the use of spreadsheet activities. Kılıç (2015) also found that there was a negative correlation between computer anxiety and self-efficacy among music teachers. In their non-experimental correlational research, Tatar et al. (2015) focused on the relationship between pre-service teachers' perceptions of technology and mathematics teaching anxiety. In the study, it was found that there was a low level of relationship between the levels of teaching anxiety and computer literacy. For understanding cultural differences regarding technology-

related anxiety among pre-service teachers, Efe and Efe (2016) compared the anxiety levels between Swiss and Turkish pre-service science teachers. They found that teachers in both groups suffered from anxiety while using technology. Aydin (2016) also noted that pre-service teachers suffered from teaching anxiety due to technical concerns. Given that anxiety among teachers is one of the factors that may influence the acceptance, adaptation, and integration of mobile devices in teaching, Chiu and Churchill (2016) examined how anxiety could change regarding the use of the mentioned devices. In this quasi-experimental study, 62 teachers were used to collect data via a self-report questionnaire. They found that teachers had a low level of anxiety after using mobile devices in teaching. In another research, Dove and Dove (2017) investigated how in-class lectures, flipped learning with teacher-created videos, and flipped classrooms improved mathematics anxiety and anxiety about teaching mathematics. They suggested that flipped learning with teacher-created videos decreased mathematics anxiety and anxiety about teaching mathematics. Last, noting that research on the integration of 3D printing technology in formal educational contexts was fairly limited, Novak and Wisdom (2018) explored the effects of collaborative 3D printing inquiry-based learning experiences on anxiety toward teaching science, self-efficacy beliefs, science content knowledge, perceived competence in K-3 technology, and interest in science among pre-service science teachers. Results showed that the 3D printing project intervention decreased anxiety levels.

4. Conclusions and Discussion

In the broadest perspective, the study concludes that teaching anxiety, defined as the feelings of tension before, during, and after the teaching process, is an affective state that results in adverse effects on the learning and teaching processes. It can be stated that teaching anxiety has adverse effects on teaching effectiveness, work environment, teaching behaviors, the preparation and execution of classroom activities, and real or perceived knowledge deficits in content and teaching skills. It also results in stress, avoidance, problems concerning planning, time management, and organization of the classroom environment. Moreover, teaching anxiety causes failure, a decline in academic performance, inability to concentrate on lessons, avoidance of personal relationships and social surroundings. In addition, due to teaching anxiety, teachers tend to pass anxiety to their students, avoid new teaching methods and techniques, and experience burnout.

When the analysis of the publications reviewed in the study is considered, several conclusions can be listed. First, it is seen that the interest in research on teaching anxiety showed an increase since 2009, while rare studies appeared between the years of 1973 and 2008. Second, in terms of the teaching position, researchers mainly prefer to use pre-service teachers as sample groups in their studies. Third, research on teaching anxiety mainly focuses on the teaching contexts of Mathematics, English as a foreign language, Elementary Education, and Science. At the same time, rare studies appeared on Music Education, Accounting, Early Childhood Education, Library, Psychology, English as a first language, Agriculture, Sociology, Computer and Instructional Technologies, Physical Education, and Nurse Education. Fourth, the studies are mainly designed to be descriptive. At a moderate level, correlational, qualitative, and experimental research designs are preferred, while rare studies use mixed-method, quasi-experimental, and action research designs. Fifth, in terms of measurement tools, scales are mostly used by researchers, while some use questionnaires and surveys. Interviews, inventories, reflections, self-report questionnaires, observations, assignments, and personal narratives are also preferred. Last, studies on teaching anxiety are mostly performed in the educational contexts of Turkey and the USA. Several studies also focus on teaching anxiety in the educational contexts of Canada, Australia, Iran, Japan, the

UK, and China. Germany, Korea, North Cyprus, Oman, and Lebanon are the countries where studies are carried out.

When the findings of the studies reviewed are taken into account, the following conclusions regarding teachers' affective states can be presented. The first conclusion is that teaching anxiety relates to teachers' beliefs. More specifically, there is a negative relationship between teaching anxiety and traditional beliefs about teaching and learning, their epistemological beliefs, constructivist beliefs about content knowledge, and self-efficacy beliefs. Second, teaching anxiety is concerning attitudes towards teaching. In other words, negative attitudes are a source and predictor of teaching anxiety. Third, pre-service teachers suffer from teaching anxiety due to demotivation, amotivation, and lack of self-esteem. The fourth conclusion obtained from the study is that teaching anxiety stems from other types of anxiety. Within this scope, anxiety in the teaching context is similar to anxiety in the learning context, whereas teaching anxiety is predicted by trait anxiety. In addition, fear of negative evaluation, communication apprehension, fear of public speaking, speech anxiety, fear of failure, test anxiety provoked by staff selection examinations and tests during the pre-service training process, and spatial anxiety are the sources that trigger teaching anxiety. Fifth, self-efficacy levels are directly related to teaching anxiety. In other words, the ones with the highest levels of self-efficacy have the lowest degree of anxiety. Sixth and last, teaching anxiety is also correlated with stress, burnout, aggressiveness, self-deception, locus of control, and self-confidence. The causes of stress, burnout, emotional exhaustion, aggressiveness, and the lack of self-confidence among teachers are the predictors of teaching anxiety, while locus of control is positively related to teaching anxiety.

The study also concludes that the relationship between teaching anxiety levels and demographic variables is not clear. First, age differences regarding teaching anxiety are conflicting. In other words, while some studies conclude that age is not associated with anxiety, there is evidence that older teachers experience less anxiety. Second, there is also no consensus on the relationship between gender and teaching anxiety levels. While it was concluded that gender does not constitute a considerable variable regarding teaching anxiety, research results point out that female teachers feel more anxious than males. Third, the relationship between anxiety levels among pre-service teachers and their grades is not also clear. For instance, there is evidence that shows higher levels of teaching anxiety among ones at higher grades. However, some studies conclude that grade and anxiety levels are not correlated. Fourth, the conclusions reached on the relationship between teachers' fields and anxiety levels are also conflicting. Within this scope, it can be stated that language teachers seem more anxious than the ones teaching at elementary level schools, while it should be noted that teaching fields do not differ regarding teaching anxiety. On the other hand, when the number of studies that focus on certain fields is taken into account, it can be pointed out that teaching anxiety is a serious issue among Mathematics, English as a foreign language, Elementary Education, and Science teachers. Fifth and last, it can be concluded that academic rank, teaching position, and socioeconomic situation predict teaching anxiety, while career length does not seem to relate to anxiety levels.

Another conclusion reached in the study is that teaching experience, content knowledge, and instruction are considerably related to teaching anxiety. First of all, there is a strong relationship between the levels of teaching experience and teaching anxiety. For instance, unpleasant experiences, teaching inexperience, and problematic classroom experiences provoke teaching anxiety. In addition, novice and pre-service teachers seem more anxious when compared to experienced teachers. Second, content knowledge and teaching anxiety are closely and directly related. In other words, the lack of content knowledge, pedagogical knowledge, proficiency, perceived difficulty, and negative perceptions towards teaching content are the strong predictors of teaching anxiety. Last, the instruction process is a

considerable variable that decreases the level of anxiety among teachers. Within this scope, teaching courses, training in the self-management of stress and tension, stress inoculation training, and formal and informal training programs decrease anxiety levels. Moreover, teachers experience lower anxiety levels when they have training on classroom management, role-play, concept mapping, visualization, problem-solving, ethics of teaching, conceptual understanding, concrete materials, and microteaching. The instructions on curriculum development, assessment, and intrapersonal reflection reduce teaching anxiety. Nevertheless, only the result of one study claims that formal training in teaching is not associated with anxiety.

This review concludes that more variables such as teachers' and students' characteristics, teaching strategies, time and classroom management, planning, and school climate may affect teaching anxiety levels. First, teachers' characteristics are one of the significant variables that may affect the level of teaching anxiety. For example, the ones who perceive themselves as introverted, global, and lifelong learners are more anxious than extroverts, visual, auditory, tactile, convergent, intuitive-random, concrete sequential, closure-oriented, divergent, accommodator, assimilator, open, and neurotic ones. Second, research is not conclusive regarding the relationship between teaching anxiety and students' characteristics. For example, questions asked by students, anxiety among students, and student violence trigger teaching anxiety, while the results of one study claim that age groups of students and their understandings do not affect anxiety among teachers. Third, in terms of teaching strategies, the use of various reform-based strategies effectively decreases teaching anxiety. Fourth, time and classroom management are correlated with teaching anxiety. For example, problems concerning whole-class instruction time, classroom management, communication in the classroom, behavior management, teaching management, perceptions of lesson organization, and unpreparedness provoke anxiety among teachers. Fourth and last, school climate and the levels of teaching anxiety seem to be interrelated. For example, teachers who are positive about the learning climate experience a low level of anxiety, while teachers working in open-plan schools and experiencing work pressures feel more anxious. Moreover, the principal's support, good staff relations, and organizational commitment are the factors that decrease the level of teaching anxiety.

The last conclusion obtained from the study is that the use of technology is one of the predictors of teaching anxiety. First, teachers who have computer skills, computer literacy, experience, and positive attitudes toward computers and network use are less anxious. Moreover, online discussions, the use of WebQuest, the utilization of mobile devices, the formative use of videotaped micro-teaching, flipped learning with teacher-created videos, and collaborative 3D printing inquiry-based learning experiences are also effective for lowering anxiety. However, it should be stated that teachers also suffer from teaching anxiety due to technical concerns and the use of spreadsheet activities.

4.1. Practical Recommendations

Some practical recommendations regarding the conclusions of this review can be noted. First and in the broadest perspective, teachers should be aware that teaching anxiety is one of the most considerable concerns in the teaching and learning processes that directly and negatively affect teaching effectiveness and behaviors, work environment, and classroom activities. With this recognition, they can cope with the problems with planning, time management, and organization of the classroom environment, and improve their academic performance, personal and social surroundings. To achieve these, they should find ways to develop strong beliefs of teaching and learning, have positive attitudes towards the mentioned processes, and strengthen their teaching and learning motivation. Next, since teaching anxiety is not independent of anxiety in the learning context, and the elements of anxiety such as trait

anxiety, fear of negative evaluation, communication apprehension, and test anxiety, teachers should have a deeper understanding of the mentioned anxiety types. Moreover, they should find ways to improve their self-efficacy and self-confidence and how to cope with stress and burnout. Second, teachers should know that gaining experience in teaching decreases anxiety, whereas they should improve their content and pedagogical knowledge of coping with anxiety. For this, they should have training and instructions by participating in courses and training programs. Third, they should act as learners such as extroverts, visual, auditory, tactile, convergent, intuitive-random, concrete sequential, closure-oriented, divergent, accommodator, assimilator, and open learners to cope with teaching anxiety. Moreover, they should use reform-based strategies and develop classroom management, communication skills, and lesson organization, whereas they should pay attention to planning activities and preparedness. Teachers should also contribute to creating a positive school climate. As a final note, it can be recommended that teachers should develop techno-pedagogical knowledge and skills, computer and network literacy, and use them in classroom settings.

A few recommendations for pre- and in-service teaching program developers can be noted. First of all, issues about teaching anxiety should be integrated into the content of the mentioned programs. For this purpose, issues such as theoretical information on teaching anxiety, its sources and effects should be implemented in the programs to raise teachers' awareness of anxiety. Within this scope, it should be considered that Mathematics, English as a foreign language, Elementary Education, and Science require special attention, whereas how demographic variables relate to teaching anxiety should also be considered. Second, one of the main focuses of the programs should be on developing strategies to deepen teachers' content knowledge. In addition, as there is a strong relationship between teaching anxiety and experience, pre-service teacher training programs should include teaching practice at a high level. More specifically, pre- and in-service teacher training programs should help them have positive perceptions of course content and include various content such as classroom management, role-play, concept mapping, visualization, problem-solving, ethics of teaching, microteaching, curriculum development, and assessment. Students' and teachers' characteristics, teaching strategies, time and classroom management, communication strategies, lesson planning and organization, computer, and network literacy are some other contents that should be implemented into teacher training programs.

A final recommendation is for school administrators. Considering that a negative school climate is a source of teaching anxiety, school administrators should create a positive learning environment. In this way, teachers who experience high anxiety levels will decrease anxiety and contribute to creating positive teaching and learning environments in school settings. Thus, school administrators should spread an effort to act as leader, guide, and organizer to decrease the level of anxiety among teachers and create positive teaching and learning atmospheres with all stakeholders.

4.2. Recommendations for Further Researches

Some recommendations for further researches in terms of the conclusions of the study can be listed. First of all, studies are mainly directed towards problems within the scope of practical research. Thus, basic and applied research is necessary to improve the theories for a more in-depth and better understanding of teaching anxiety, draw a theoretical framework and use the theoretical framework to develop techniques, tactics, and strategies. Second, as research mainly focuses on teaching anxiety in the pre-service teaching process, studies should concentrate on teaching anxiety in the in-service teaching process. Third, as studies are mostly performed in the teaching contexts of Mathematics, English as a foreign language, Elementary Education, and Science, researchers should be interested in some other educational contexts. Fourth, as studies are mainly designed to be descriptive and

correlational, researchers should prefer qualitative and experimental research designs to obtain findings in realistic settings rather than participants' perceptions of test anxiety. Action research, for instance, can be preferred to present solutions with regard to teaching anxiety. Within this scope, data collection tools should also be used in a variety of ranges. As a final note, since the studies are mainly performed in the educational context of Turkey and the USA, researchers should widen their perspectives in terms of various educational settings.

More researches are warranted, as it is evident that current research lacks data on some specific issues. Firstly and most importantly, research should clarify the relationship between teaching anxiety and affective states. Next, how teaching anxiety relates to demographic variables should be researched, as the relationships between teaching anxiety and certain variables such as age, gender, grade, teaching fields, academic rank, teaching position, and socioeconomic situations are not conclusive. Experience and instruction effect on teaching anxiety should also be reexamined in various educational contexts using qualitative, experimental, mixed-method, and action research designs. Another recommendation for further research is that more research is warranted on how teachers' and students' characteristics affect teaching anxiety. Moreover, problems in classroom management, communication skills, behavior management, teaching management, planning, and school climate should be investigated within the scope of action research. Finally, given that information and communication technologies bring new horizons to the learning and teaching contexts, technology effects on teaching anxiety should be investigated using various technological tools and environments.

5. Conflict of interest

No potential conflict of interest was reported by the authors.

6. Ethics Committee Approval

The authors confirm that the study does not need ethics committee approval according to the research integrity rules in their country.

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Appendix

Appendix 1. *Distribution of the publications by authors, journals, participants, teaching levels, fields, research designs, tools, and countries*

	Authors	Journals	Participants	Levels	Fields	Research Designs	Tools	Countries
1.	Aksu & Kul (2019)	SAGE Open	463	Pre-service	Mathematics	Descriptive	Scale	Turkey
2.	Al-Mehrzi et al. (2011)	World Applied Sciences Journal	329	Pre-service	Various	Descriptive	Questionnaire	Oman
3.	Ameen at al. (2002)	Journal of Education for Business	333	In-service	Accounting	Descriptive	Questionnaire	USA
4.	Aslrasouli & Vahid (2014)	Procedia - Social and Behavioral Sciences	114	In-service	English as a foreign language	Descriptive	Questionnaire	Iran
5.	Aydin (2016)	The Qualitative Report	60	Pre-service	English as a foreign language	Qualitative	Interview	Turkey
6.	Bekdemir (2010)	Educational Studies in Mathematics	167	Pre-service	Mathematics	Descriptive	Questionnaire	Turkey
7.	Brown et al. (2011)	Issues in the Undergraduate Mathematics Preparation of School Teachers	53	Pre-service	Mathematics	Qualitative	Assignment	USA
8.	Brown et al. (2012)	Teaching Education	55	Pre-service	Mathematics	Qualitative	Reflection	USA
9.	Bursal & Paznokas (2006)	School Science and Mathematics	65	Pre-service	Mathematics	Descriptive	Survey	USA
10.	Peker & Halat (2009)	Journal of Applied Sciences	73	Pre-service	Mathematics	Experimental	Scale	Turkey
11.	Capel (1992)	European Journal of Teacher Education	405	In-service	Various	Descriptive	Scale	UK
12.	Cankaya (2011)	Social Behavior and Personality: An International Journal	251	In-service	Various	Descriptive	Scale	Turkey
13.	Chavez & Widmer (1982)	Educational Leadership	203	In-service	Mathematics	Descriptive	Scale	USA
14.	Cheung & Hui (2011)	Asia-Pacific Education Researcher	333	In-service	Various	Descriptive	Scale	China
15.	Chiu & Churchill (2016).	Interactive Learning Environments	62	In-service	Various	Quasi-experimental	Self-report questionnaire	China
16.	Cotterell (1984)	Environment and Behavior	N/A	In-service	Various	Qualitative	Observation	Australia
17.	Czerniak & Haney (1998)	Journal of Science Teacher Education	118	Pre-service	Elementary	Experimental	Scale	USA
18.	Daniels et al. (2011)	Alberta Journal of Educational Research	137	Pre-service	Various	Descriptive	Questionnaire	Canada
19.	Davis (2007)	College & Undergraduate Libraries	382	In-service	Library	Descriptive	Questionnaire	USA
20.	Deniz & Üldeş (2008)	Eurasian Journal of Educational Research	1568	Pre-service	Mathematics	Descriptive	Scale	Turkey
21.	Dove & Dove (2017)	Contemporary Issues in Technology and Teacher Education	39	Pre-service	Mathematics	Descriptive	Scale	USA
22.	Doyal & Forsyth (1973)	Psychology in the Schools	244	In-service	Various	Descriptive	Scale	USA

23.	Durdukoca & Atalay (2019)	International Journal of Evaluation and Research in Education	263	Pre-service	Various	Descriptive	Survey	Turkey
24.	Efe & Efe (2016)	Journal of Education and Training Studies	538	Pre-service	Science	Descriptive	Scale	Turkey
25.	Ekşi & Yakışık (2016)	Universal Journal of Educational Research	52	Pre-service	English as a foreign language	Descriptive	Questionnaire	Turkey
26.	Engin (2019)	Educational Policy Analysis and Strategic Research	265	Pre-service	Various	Correlational	Scale	Turkey
27.	Ertekin (2010)	Educational Research and Reviews	299	Pre-service	Mathematics	Correlational	Scale	Turkey
28.	Ertekin et al. (2010)	Educational Research and Reviews	279	Pre-service	Mathematics	Correlational	Scale	Turkey
29.	Frenzel et al. (2016)	Contemporary Educational Psychology	944	In-service	Various	Descriptive	Scale	Germany
30.	Ganley et al. (2019)	AERA Open	399	In-service	Mathematics	Descriptive	Scale	USA
31.	Gardner & Leak (1994)	Teaching of Psychology	N/A	In	Psychology	Descriptive	Survey	USA
32.	Giovanelli (2015)	Language and Education	7	In	English as a first language	Qualitative	Interview	UK
33.	Gresham (2007)	Journal of Invitational Theory and Practice	264	Pre-service	Mathematics	Descriptive	Scale	USA
34.	Gresham (2009)	Journal of Classroom Interaction	156	Pre-service	Mathematics	Descriptive	Scale	USA
35.	Gresham (2010)	Issues in the Undergraduate Mathematics Preparation of School Teachers	52	Pre-service	Mathematics	Mixed-method	Survey	USA
36.	Gresham & Burleigh (2019)	Teaching Education	34	Pre-service	Early Childhood	Qualitative	Interview	USA
37.	Gunderson et al. (2013)	Mind, Brain, and Education	19	In-service	Mathematics	Descriptive	Scale	USA
38.	Guzicki et al. (1980)	Journal of School Psychology	2	In-service	Elementary	Qualitative	Observation	USA
39.	Han & Tulgar (2019)	GIST Education and Learning Research Journal	32	Pre-service	English as a foreign language	Qualitative	Self-report questionnaire	Turkey
40.	Harris & Grandgenett (1996)	Journal of Research on Computing in Education	189	In-service	Accounting	Correlational	Scale	USA
41.	Hawley & Sinatra (2019)	Journal of Research in Science Teaching	50	In-service	Science	Experimental	Scale	USA
42.	Houlihan et al. (2009)	Canadian Journal of Higher Education	22	In-service	Various	Descriptive	Survey	Canada
43.	Hughes et al. (2019)	School Science and Mathematics	153	In-service	Elementary	Descriptive	Scale	USA
44.	Ihtiyaroglu (2019)	World Journal of Education	484	Pre-service	Various	Correlational	Scale	Turkey
45.	Johns (1992)	The School Counselor	N/A	In-service	Elementary	Action research	Survey	USA
46.	Kana (2015)	International Journal of Progressive Education	540	In-service	Various	Correlational	Scale	Turkey
47.	Karatas et al. (2014)	Educational Sciences: Theory and Practice	381	In-service	Elementary	Correlational	Scale	Turkey

48.	Kayan Fadlilmula (2012)	The International Journal of Science, Mathematics and Technology Learning	120	Pre-service	Mathematics	Descriptive	Questionnaire	Turkey
49.	Kılıç (2015)	Educational Research and Reviews	124	In-service	Music	Descriptive	Scale	Turkey
50.	Kotrlik & Smith (1989)	Journal of Agricultural Education	295	In-service	Agriculture	Descriptive	Scale	USA
51.	Kralova & Tirpakova (2019)	SAGE Open	175	In	English as a foreign language	Mixed-method	Scale	Slovakia
52.	Kunt & Tüm (2010)	Procedia - Social and Behavioral Sciences	N/A	Pre-service	English as a foreign language	Descriptive	Scale	North Cyprus
53.	Lake & Kelly (2014)	Journal of Early Childhood Teacher Education	30	Pre-service	Mathematics	Qualitative	Reflection	USA
54.	Liu (2008)	Education	39	Pre-service	Elementary	Descriptive	Questionnaire	USA
55.	Machida (2016)	TESOL Journal	133	In-service	English as a foreign language	Descriptive	Scale	Japan
56.	Mahmoodi-Shahrehabaki (2017)	Teachers and Teaching	276	In-service	English as a foreign language	Correlational	Scale	Iran
57.	Malinsky et al. (2006)	Education	481	Pre-service	Mathematics	Correlational	Scale	USA
58.	Morton et al. (1997)	British Journal of Educational Psychology	135	Pre-service	Elementary	Correlational	Scale	Canada
59.	Novak & Wisdom (2018)	Journal of Science Education and Technology	42	Pre-service	Science	Experimental	Inventory	USA
60.	Olson & Stoehr (2019)	School Science and Mathematics	3	Pre-service	Mathematics	Qualitative	Personal narrative	Canada
61.	Oral (2012)	Journal of Applied Social Psychology	700	Pre-service	Various	Descriptive	Scale	Turkey
62.	Özcan (2019)	International Journal of Contemporary Educational Research	320	Pre-service	Various	Descriptive	Scale	Turkey
63.	Özdemir & Seker (2017)	International Education Studies	108	Pre-service	Elementary	Descriptive	Scale	Turkey
64.	Özen & Öztürk (2016)	Universal Journal of Educational Research	455	Pre-service	Various	Correlational	Scale	Turkey
65.	Öztürk (2018)	International Education Studies	168	In-service	Various	Descriptive	Scale	Turkey
66.	Paker (2011)	Eurasian Journal of Educational Research	101	In-service	English as a foreign language	Descriptive	Scale	Turkey
67.	Payne & Manning (1990)	Contemporary Educational Psychology	67	Pre-service	Various	Experimental	Survey	USA
68.	Peker (2009a)	Eurasia Journal of Mathematics, Science & Technology Education	205	Pre-service	Mathematics	Descriptive	Scale	Turkey
69.	Peker (2009b)	The New Educational Review	70	Pre-service	Mathematics	Experimental	Scale	Turkey
70.	Peker (2009c)	Scientific Research and Essays	43	Pre-service	Mathematics	Experimental	Scale	Turkey
71.	Peker (2016)	Educational Research and Reviews	250	Pre-service	Mathematics	Descriptive	Scale	Turkey
72.	Peker & Ertekin (2011)	The New Educational Review	316	Pre-service	Mathematics	Descriptive	Scale	Turkey
73.	Peker & Ulu (2018)	International Journal of Instruction	248	Pre-service	Mathematics	Correlational	Survey	Turkey

74.	Pelton (2014)	Teaching Sociology	40	In-service	Sociology	Experimental	Scale	USA
75.	Preece (1979)	British Educational Research Journal	100	Pre-service	Science	Descriptive	Inventory	UK
76.	Pigge & Marso (1994)	Mid-western Educational Researcher	150	Pre-service	Science	Descriptive	Scale	USA
77.	Ramazanoğlu & Toytok (2018)	Journal of Education and Training Studies	184	Pre-service	Computer and instructional technologies	Descriptive	Survey	Turkey
78.	Roach (2003)	Educational Research and Reviews	121	Pre-service	Various	Descriptive	Scale	USA
79.	Robinson & Clay (2005)	Psychology in the Schools	56	In-service	Elementary	Descriptive	Inventory	USA
80.	Sağlam (2014)	Procedia - Social and Behavioral Sciences	104	Pre-service	Mathematics	Descriptive	Questionnaire	Turkey
81.	Savas et al. (2013)	The Anthropologist	165	In-service	Elementary	Descriptive	Scale	Turkey
82.	Savenye (1992)	Journal of Computing in Childhood Education		Pre-service	Early Childhood	Descriptive	Scale	USA
83.	Seckin & Yilmaz (2014)	Hacettepe University Journal of Education	53	Pre-service	Science	Experimental	Scale	Turkey
84.	Senler (2016)	Australian Journal of Education	356	Pre-service	Science	Descriptive	Scale	Turkey
85.	Sharp & Forman (1985)	Behavior Therapy	60	In-service	Various	Qualitative	Self-report questionnaire	USA
86.	Shirvani (2018)	The International Journal of Science, Mathematics and Technology Learning	124	Pre-service	Various	Descriptive	Scale	Iran
87.	Signer (1986)	Journal of Computers in Mathematics and Science Teaching	N/A	In-service	Mathematics	Descriptive	Scale	USA
88.	Sinclair & Ryan (1987)	Teaching and Teacher Education	19	Pre-service	Nurse Education	Experimental	Questionnaire	Australia
89.	Sinclair & Nicoll (1981)	The South Pacific Journal of Teacher Education		Pre-service	Various	Qualitative	Interview	Australia
90.	Song & Park (2019)	Changing English	14	In-service	English as a foreign language	Qualitative	Interview	Korea
91.	Tatar et al. (2015)	Journal of Educational Technology & Society	481	Pre-service	Mathematics	Correlational	Scale	Turkey
92.	Ünlü et al. (2017)	International Journal of Research in Education and Science	380	Pre-service	Mathematics	Correlational	Scale	Turkey
93.	Ümmet (2016)	Universal Journal of Educational Research	312	Pre-service	Various	Descriptive	Scale	Turkey
94.	Vinson (2001)	Early Childhood Education Journal	87	Pre-service	Mathematics	Mixed-method	Scale	USA
95.	Vitale (2012)	Brock Education: A Journal of Educational Research and Practice	1	In-service	Music	Qualitative	Reflection	Canada
96.	Westerback et al. (1985)	Journal of Research in Science Teaching		Pre-service	Elementary	Descriptive	Scale	USA
97.	Williams (1991)	Research in Higher Education	27	In-service	English as a foreign language	Experimental	Scale	USA
98.	Wilson (2013)	Australian and International Journal of Rural Education	219	Pre-service	Mathematics	Descriptive	Scale	Australia

99.	Yadav & Sharma (2013)	Journal on School Educational Technology	130	In-service	Various	Correlational	Scale	N/A
100.	Yaghi & Abu-Saba (1998)	Computers in Human Behavior	308	In-service	Various	Descriptive	Scale	Lebanon
101.	Yamaguchi et al. (2016)	International Conference on Human Interface and the Management of Information	143	In-service	Physical Education	Descriptive	Survey	Japan
102.	Yorimitsu et al. (2014)	Asia Pacific Education Review	14	In-service	Various	Qualitative	Interview	Japan
103.	Yavuz (2018)	International Journal of Higher Education	359	Pre-service	Mathematics	Descriptive	Scale	Turkey
104.	Yazıcı & Ertekin (2010)	International Journal of Educational and Pedagogical Sciences	299	Pre-service	Mathematics	Correlational	Scale	Turkey
105.	Yazıcı et al. (2011)	Electronic Journal of Research in Educational Psychology	359	Pre-service	Mathematics	Correlational	Scale	Turkey
106.	Yorulmaz et al. (2017)	European Journal of Educational Research	194	In-service	Mathematics	Correlational	Scale	Turkey
107.	Yürük (2011)	Journal of Baltic Science Education	82	Pre-service	Science	Descriptive	Scale	Turkey
108.	Zahal (2016)	Educational Research and Reviews	99	Pre-service	Music	Correlational	Inventory	Turkey